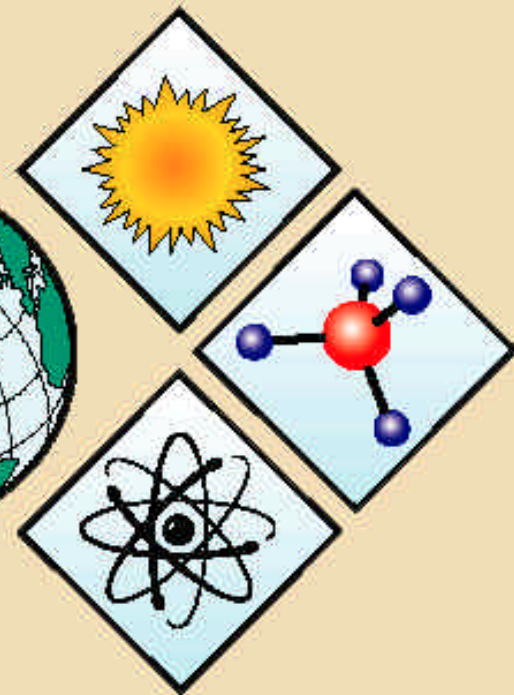


The FY 2001 Nuclear Energy,
Science and Technology
Budget Request

***Strength
Through
Science***



**William D. Magwood, IV, Director
Office of Nuclear Energy, Science and Technology**

February 7, 2000



Major Goals and Accomplishments

Nuclear Energy Research Initiative, addressing obstacles to long term use of nuclear energy and technology:

46 R&D projects underway by universities, labs, and industry and growing to over 70 projects by FY2001



***Nuclear Energy Plant Optimization program
is in its inaugural year:*** Funding 15 R&D projects with industry to address reliability and efficiency issues associated with extended operation of existing nuclear power plants

DOE's NERAC: With seven subcommittees now working to guide the future direction of federal nuclear technology R&D



Major Goals and Accomplishments

University Reactor Fuel Assistance and Support: Training the next generation of nuclear engineers and scientists and increasing minority student entry into nuclear engineering fields



This year, the Department launched the Advanced Nuclear Medicine Initiative: Conducting advanced research into medical isotope applications and providing isotopes to U.S. researchers



Electrometallurgical Treatment Technology: A successfully demonstrated technology for treatment of sodium bonded spent nuclear fuels



FY 2001 Nuclear Energy, Science and Technology Budget

Advancing Science and Technology at Home and Abroad

Energy Supply

<u>Program</u>	<u>FY2000 Approp.</u>	<u>\$ in Millions FY 2001 Request</u>	<u>Percent Change</u>
Nuclear Energy Research Initiative	22.4	35.0	56.2
Nuclear Energy Plant Optimization	5.0	5.0	0.0
University Reactor Fuel Assistance and Support	12.0	12.0	0.0
Advanced Radioisotope Power Systems	34.1	31.2	(8.5)
Accelerator Transmutation of Waste	9.0	0.0	(100.0)
Fast Flux Test Facility	28.0	44.0	57.1
Electrometallurgical R&D/Termination Costs	78.8	74.0	(6.1)
TRA Landlord	8.9	9.0	1.1
Uranium Programs	41.9	53.4	27.5
Isotope Support	20.4	17.2	(15.7)
Program Direction	24.7	27.6	11.7
Offset from Revenue	--	(2.3)	
Use of Prior Year	(0.1)	--	
Total, Energy Supply	285.1	306.1	7.4

Award 20 new projects, bringing total to over 70 and launch *International-NERI*

Implement the Secretarial decision on the future of FFTF

Begin design of DUF₆ conversion facilities

Complete construction of building to house the Los Alamos Isotope Production Facility

Nuclear Energy Research Advisory Committee (NERAC)

NERAC: Advising DOE On the Future Direction of Our Nuclear Science and Technology Programs

- ◆ Long-Term Nuclear Energy Science and Technology Research Plan
- ◆ Nuclear Science and Technology Infrastructure Roadmap
- ◆ Long-Term Isotope Research and Production Plan
- ◆ Operating Nuclear Plants Research and Development Subcommittee
- ◆ Accelerator Transmutation of Waste (ATW) Subcommittee
- ◆ Panel on the *Future of University Nuclear Engineering and Research Reactors*
- ◆ Panel on *Technology Opportunities for Increasing Proliferation Resistance of Global Civilian Nuclear Power Systems*

NERAC Long-Term Nuclear Energy Science and Technology Research and Development Plan

- ◆ Long-range R&D plan to guide NE's civilian nuclear energy research out to the year 2020
- ◆ Input provided by 120 nuclear energy experts from universities, industry and national laboratories on these topics:
 - *Reactor Technology*
 - *Reactor Safety & Reliability*
 - *Advanced Fuels/Fuel Cycles*
 - *Nuclear Waste*
 - *Nuclear Plant Economics*
 - *Instrumentation & Controls*
 - *Space Nuclear Power*
 - *Materials and Corrosion*
- ◆ Will establish facility requirements for the Infrastructure Roadmap, analyzing the national R&D infrastructure needs for the future
- ◆ To be completed and submitted to NERAC this Spring

Nuclear Energy Research Initiative (NERI)

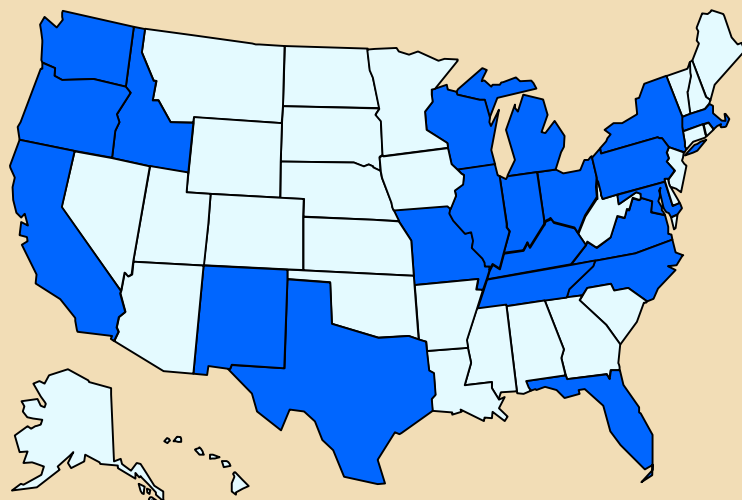
Mission Statement

Long term R&D to address key issues affecting future use of nuclear energy, to rebuild the nation's nuclear science and technology leadership.

Program Participants

Universities

Purdue	MIT	Univ. of Kentucky
Univ. of Michigan	Univ. of Florida	Univ. of Tennessee
Univ. of CA-Berkeley	Oregon State	Univ. of Virginia
Notre Dame	Univ. of Wisconsin	Univ. of California-LA
Penn State	North Carolina State	Univ. of Maryland
Texas A&M	Univ. of New Mexico	Iowa State
Ohio Univ.	New Mexico State Univ.	



National Laboratories

Argonne
Brookhaven
Idaho National Engineering and Environmental
Los Alamos
Lawrence Livermore
Oak Ridge
Pacific Northwest
Sandia

Industrial Organizations

Westinghouse
Duke Engineering
Rockwell Science Center
SRI International
Framatome Technologies
McDermott Technologies
Egan Associates
General Atomics
Pacific Sierra
ABB-Combustion Engineering
Gamma Engineering Bechtel
Materials Engineering
GE Corporate Research
Electric Power Research Institute

Government Agencies

National Institute of Standards and Technology
U.S. Nuclear Regulatory Commission

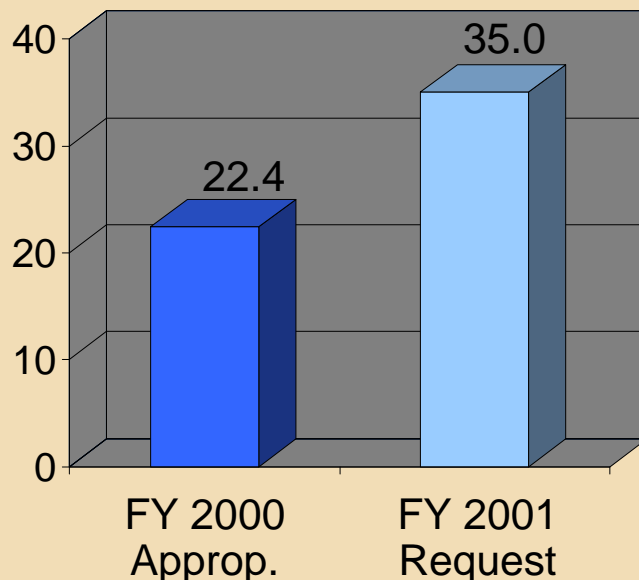
International Collaborators

Univ. of Manchester (UK)
Toyama University (Japan)
Tokai University (Japan)
Polytechnical Institute of Milan (Italy)
Siemens Corporation (Germany)
Studsvik Scanpower Inc. (Sweden)
Atomic Energy of Canada (Canada)
Commissariat a l'Energie Atomique (France)
Hitachi Ltd. (Japan)
Framatome (France)

Nuclear Energy Research Initiative (NERI)



Funding Profile
(\$ in Millions)



FY 2000 Planned Accomplishments

- ◆ Award approximately 7 new R&D projects by May 2000 in subjects including:
 - Generation IV nuclear power systems
 - Improved proliferation resistance of reactor systems and fuel cycles
 - Fundamental science
- ◆ Promising new technologies include:
 - International Reactor Innovative and Secure (IRIS)
 - Demand-driven nuclear energizer module
 - Advanced thorium metal fuels
- ◆ Held large government-to-government meeting on Generation IV advanced nuclear power systems

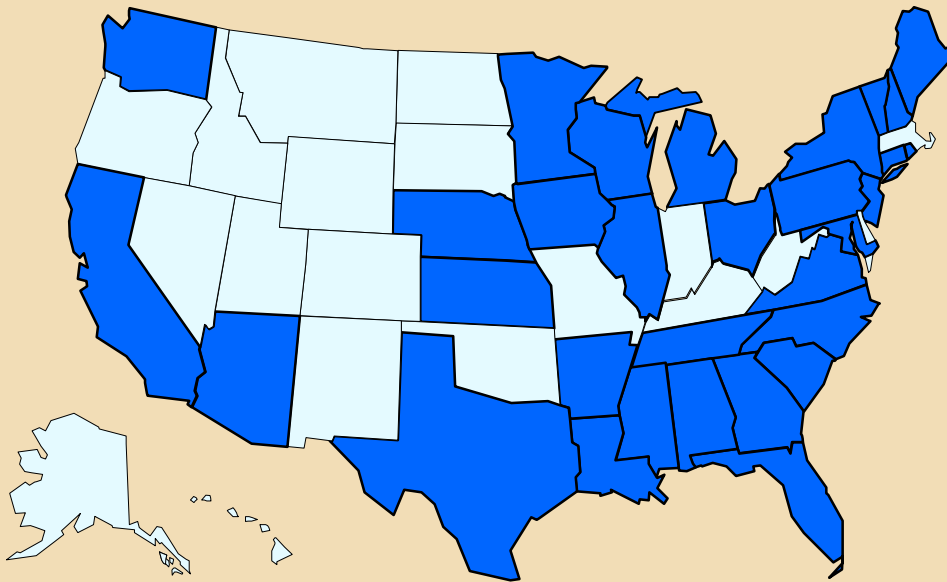
FY 2001 Planned Accomplishments

- ◆ Launch *International NERI* for bilateral and multilateral peer-reviewed R&D to rebuild U.S. nuclear technology leadership
- ◆ Award at least 20 new R&D projects by May 2001

Nuclear Energy Plant Optimization (NEPO)

Mission Statement

Promote extended operation of existing nuclear power plants through R&D on advanced technologies to improve plant availability, reliability and productivity.



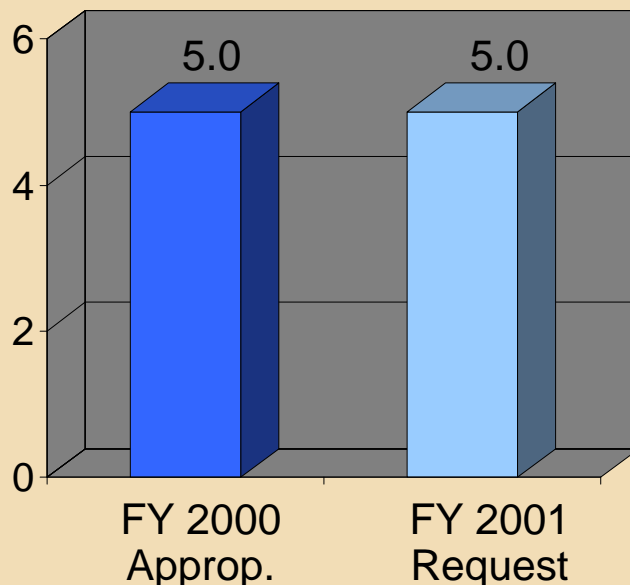
U.S. states dependent on nuclear power
to meet Clean Air Act requirements

- ◆ Nuclear power plants are helping avoid more carbon emissions each year as a result of improved performance
- ◆ Nuclear power contributes the largest single component of carbon reductions achieved by the U.S. voluntary program

Nuclear Energy Plant Optimization (NEPO)



Funding Profile
(\$ in Millions)



FY 2000 Planned Accomplishments

- ◆ Award and initiate 15 research projects, co-funded by industry, by June 2000
 - *Material fatigue*
 - *Fuel performance*
 - *Component inspections*
 - *In-service inspections and testing*
 - *Stress corrosion*
 - *Digital I&C*
 - *Human factors*
- ◆ Key projects include:
 - Development of technology for detection and characterization of defects in steam generator tubes
 - R&D on mechanical behavior of irradiated structural steels
 - Assessment of natural aging effects on components

FY 2001 Planned Accomplishments

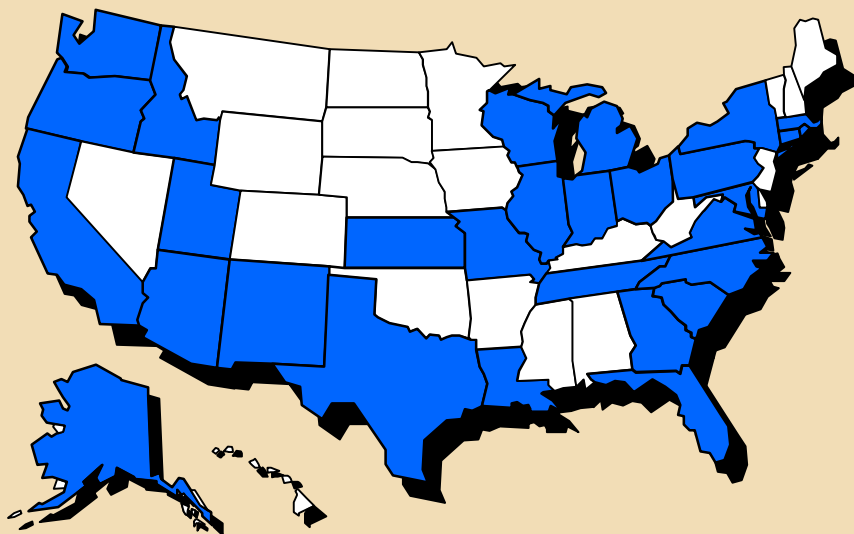
- ◆ Continue research projects, coordinating with EPRI and the Nuclear Regulatory Commission through Memoranda of Agreement
- ◆ Update and reissue the *Joint DOE/EPRI Strategic R&D Plan*, following a workshop to obtain stakeholder input

University Reactor Fuel Assistance and Support

Mission Statement

Maintain U.S. leadership in nuclear research and education to train and educate scientists and engineers with expertise in nuclear energy technologies.

Program Participants

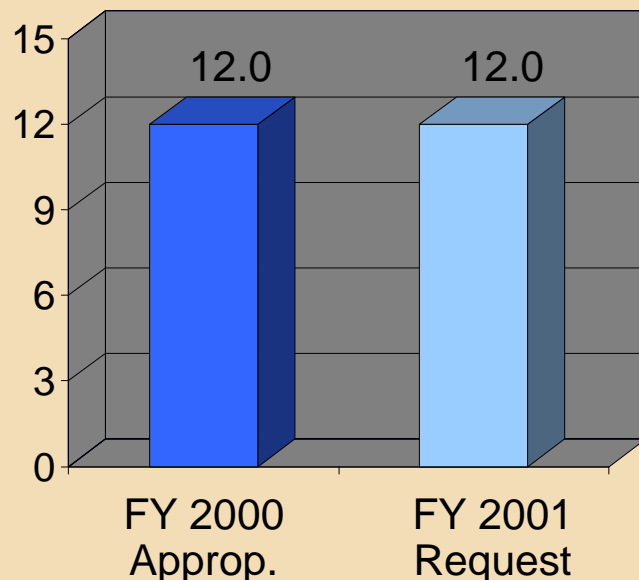


Clemson University	Tennessee State University
Cornell University	Texas A&M University
Georgia Institute of Technology	University of Alaska-Anchorage
Howard University	University of Arizona
Idaho State University	University of California-Berkeley
Jackson State University	University of Cincinnati
Kansas State University	University of Florida
Lincoln University	University of Illinois
Louisiana State University	University of Maryland
Massachusetts Institute of Technology	University of Massachusetts-Lowell
Morgan State University	University of Michigan
Morris College	University of Missouri-Columbia
North Carolina State University	University of Missouri-Rolla
North Carolina A&T State University	University of New Mexico
North Carolina Central University	University of Tennessee
Ohio State University	University of Texas
Oregon State University	University of Utah
Pennsylvania State University	University of Virginia
Prairie View A&M University	University of Wisconsin
Purdue University	Virginia State University
Reed College	Washington State University
Rensselaer Polytechnic Institute	Worcester Polytechnic Institute
Rhode Island Nuclear Science Center	Xavier University of Louisiana
South Carolina State University	

University Reactor Fuel Assistance and Support



Funding Profile
(\$ in Millions)



FY 2000 Planned Accomplishments

- ◆ Restructure the fellowship and scholarship programs to increase minority student entries into nuclear engineering
- ◆ Through the reactor sharing program, provide 23 grants to universities with research reactors for training, education, and research
- ◆ Award at least 6 new *Nuclear Energy Education Research* grants to universities, increasing the projects to 45

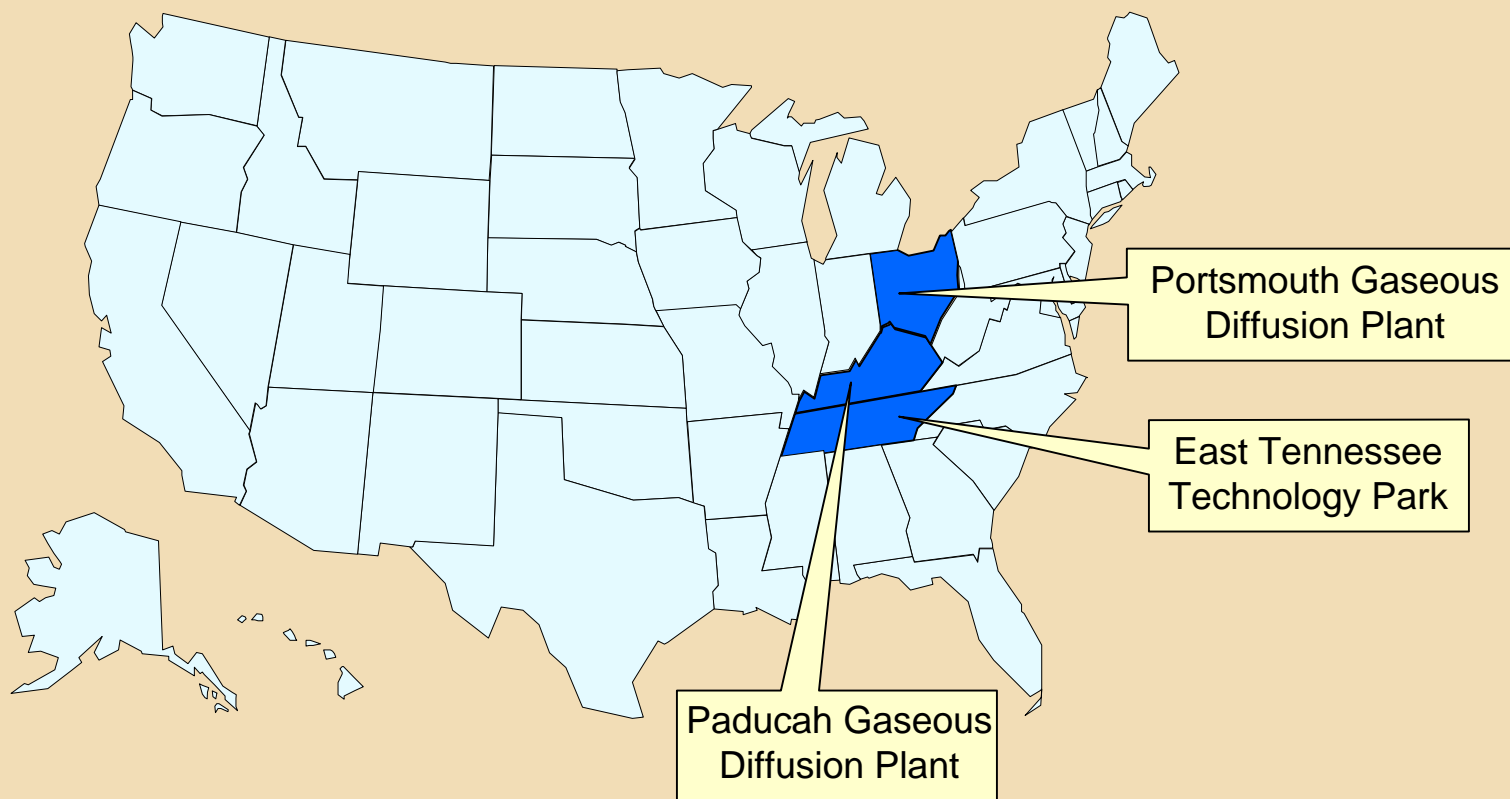
FY 2001 Planned Accomplishments

- ◆ Provide up to 24 fellowships and up to 50 scholarships/internships to outstanding students
- ◆ Provide instrumentation and equipment upgrades to at least 23 university research reactors
- ◆ Provide research reactor fuel, continue NEER and sponsor up to 23 matching grants with industry

Uranium Programs

Mission Statement

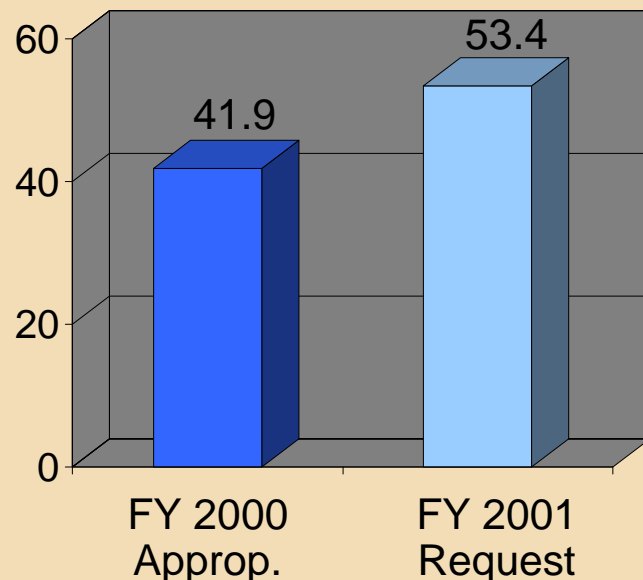
Fully address facility and environmental legacies associated with the uranium enrichment program and provide for management of government assets.



Uranium Programs



Funding Profile
(*\$ in Millions*)



FY 2000 Planned Accomplishments

- ◆ Conduct sampling to assess transuranic content of DUF_6 cylinders
- ◆ Complete characterization of criticality safety deficiencies in DOE Material Storage Areas and continue mitigation
- ◆ Conduct NEPA activities required to support implementation of depleted uranium management strategy

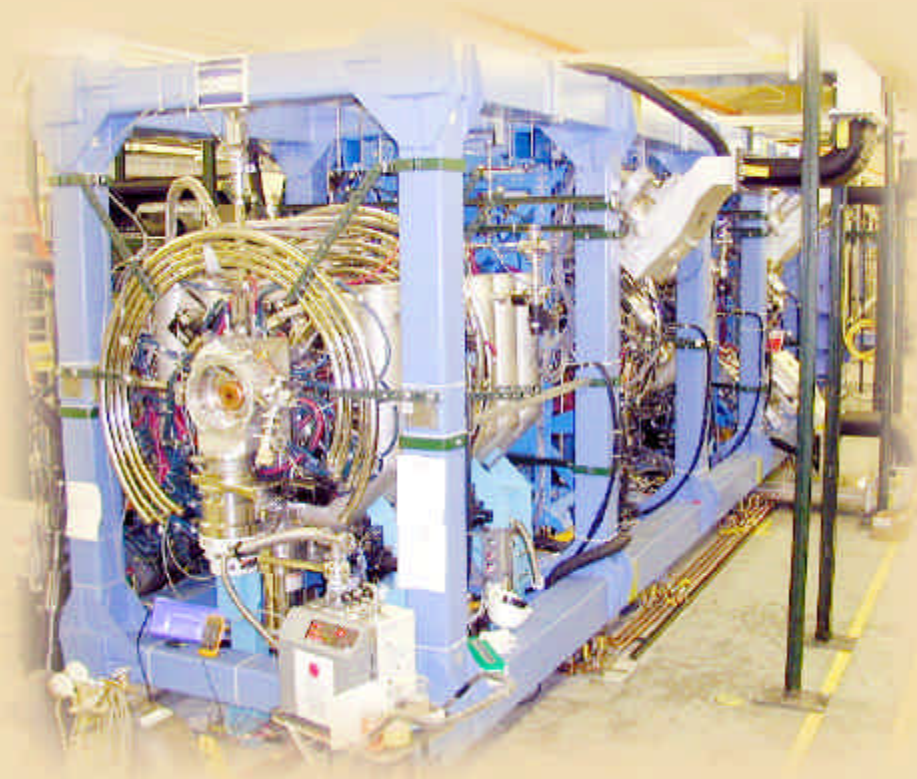
FY 2001 Planned Accomplishments

- ◆ Begin design of facilities to convert the Department's DUF_6 inventories
- ◆ Accelerate activity to recoat and maintain DUF_6 cylinders

Accelerator Transmutation of Waste (ATW)

Mission Statement

Conduct science-based R&D to develop technologies to transmute spent nuclear fuel into less toxic materials for geologic disposal.



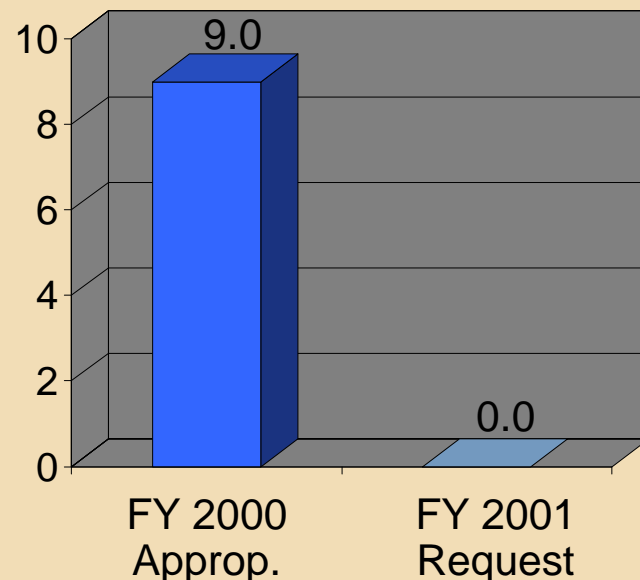
Low Energy Demonstration Accelerator

Accelerator Transmutation of Waste (ATW)

Low
Energy
Demonstration
Accelerator



Funding Profile
(\$ in Millions)



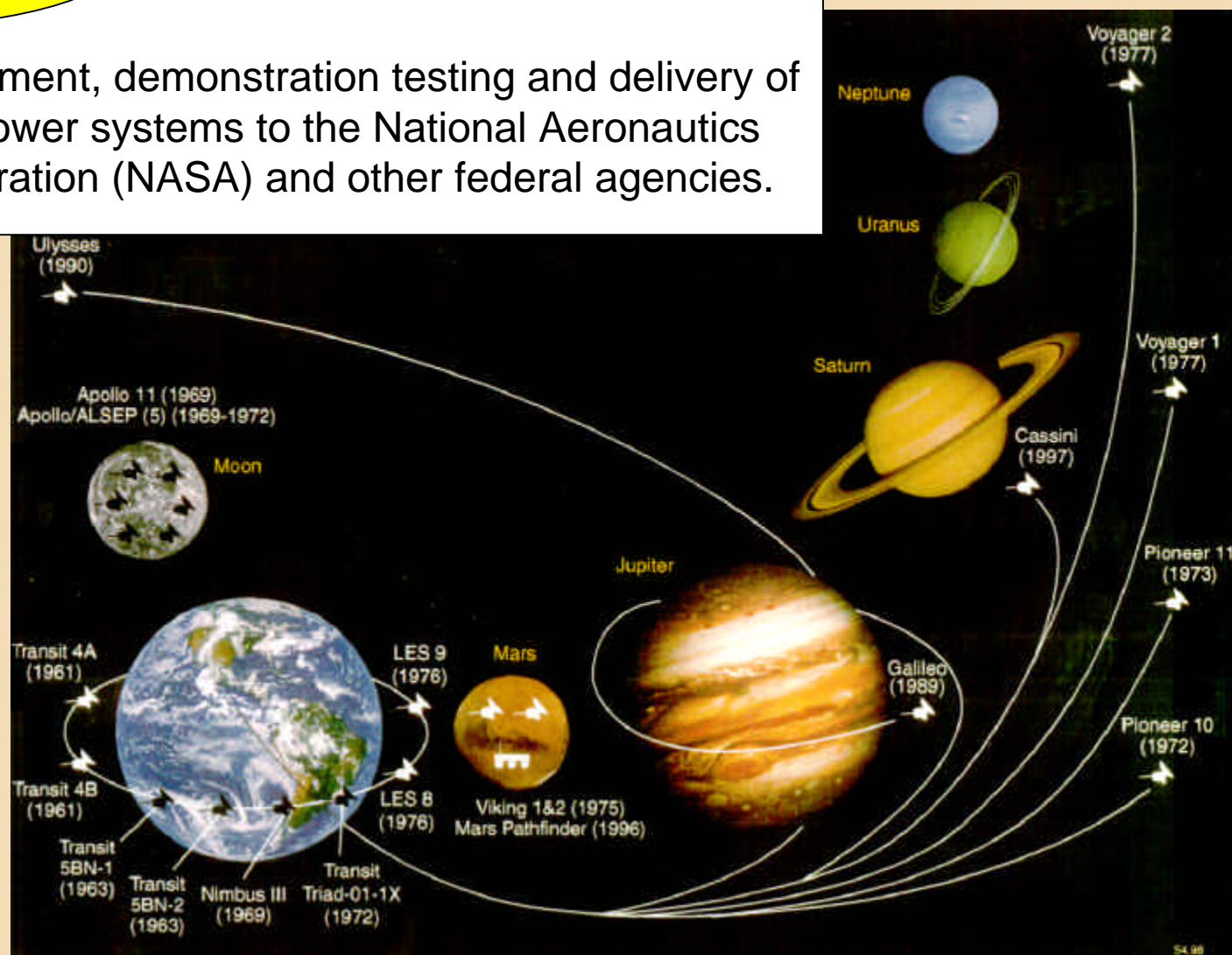
Planned Accomplishments

- ◆ Develop and issue the ATW Program Plan in FY 2000 and present the plan to OMB, OSTP, and Congress
- ◆ Conduct trade studies to establish ATW system requirements
- ◆ Initiate experimental programs on materials compatibility and separations technologies and start analysis of accelerator reliability
- ◆ Complete testing of a Russian-built lead-bismuth target by September 2000 at LANL

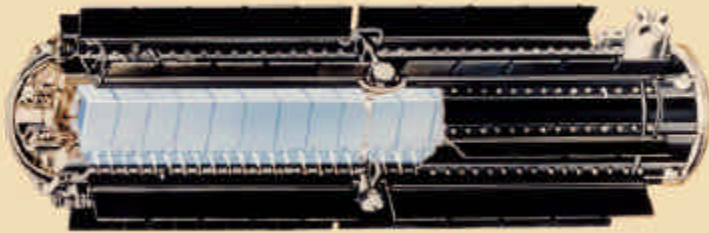
Advanced Radioisotope Power Systems

Mission Statement

Support the development, demonstration testing and delivery of advanced nuclear power systems to the National Aeronautics and Space Administration (NASA) and other federal agencies.

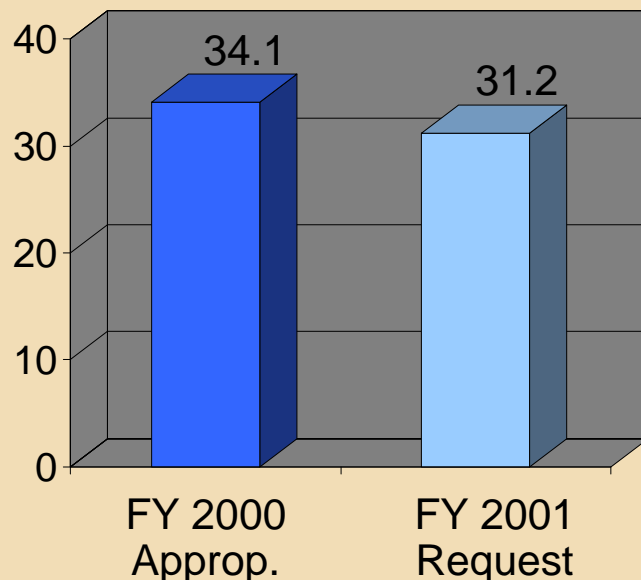


Advanced Radioisotope Power Systems



Radioisotope Thermoelectric Generator

Funding Profile
(*\$ in Millions*)



FY 2000 Planned Accomplishments

- ◆ Initiate laboratory efforts to produce small radioisotope thermoelectric generator for 2003 Europa Orbiter and 2004 Pluto/Kuiper Express missions
- ◆ Complete bench scale demonstration of plutonium-238 scrap recovery process at LANL to support future missions

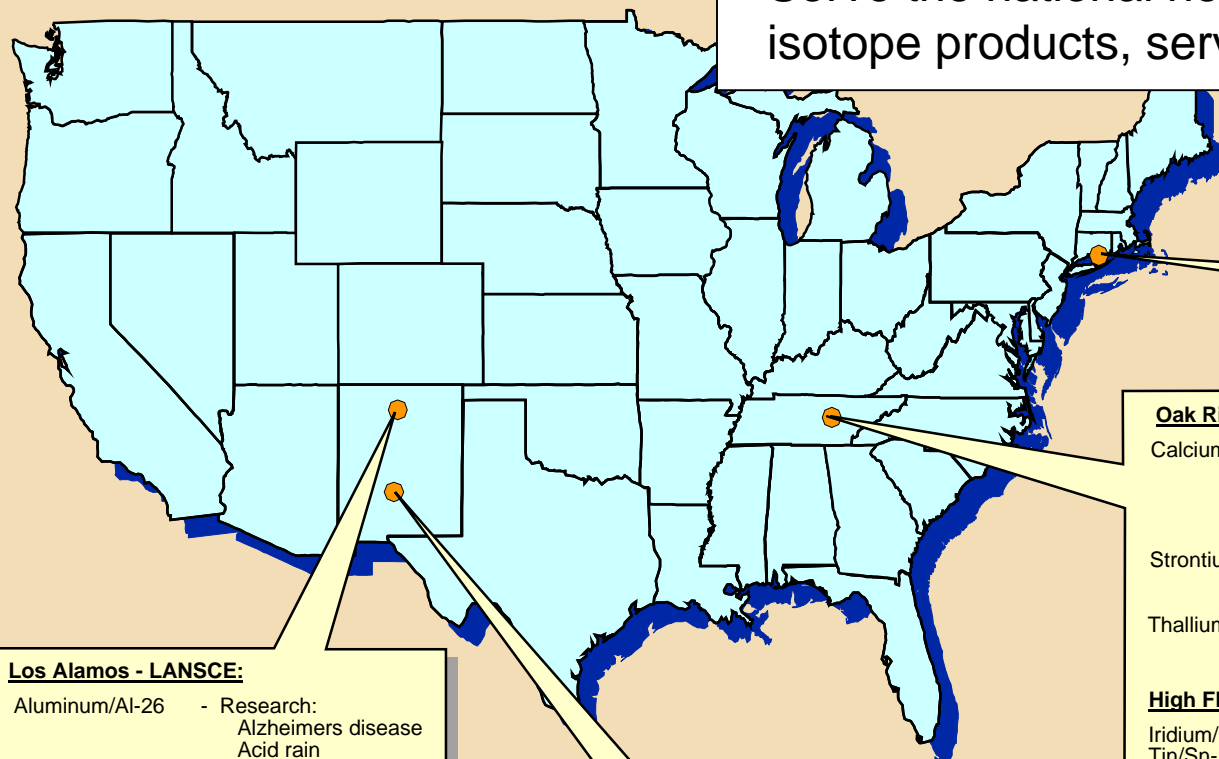
FY 2001 Planned Accomplishments

- ◆ Complete design of small RTG and begin fabrication for NASA's planned 2003/2004 launches
- ◆ Proceed with design and fabrication of an engineering unit for new thermoelectric generator for national security missions
- ◆ Support, as required, NASA use of Radioisotope Heater Units for first Mars Surveyor Launch, scheduled for April 2001

Isotope Support

Mission Statement

Serve the national need for a reliable supply of isotope products, services, and related technologies.



Los Alamos - LANSCE:

- Aluminum/Al-26 - Research:
Alzheimers disease
Acid rain
- Copper/Cu-67 - Antibody labeling for
cancer therapy &
imaging
- Germanium/Ge-68 - Calibration sources for
PET equipment;
Antibody labeling
- Strontium/Sr-82 - Cardiac imaging

Sandia - ACRR:

- Research isotopes
- Iodine/I-125 - Prostate cancer therapy

Brookhaven - BLIP:

- Strontium/Sr-82 - Cardiac imaging
- Copper/Cu-67 - Antibody labeling
for cancer therapy
& imaging

Oak Ridge - Stable Isotopes Inventory:

- Calcium/Ca-42* - Research:
-43 Nutrition
-44 Bone growth
-45 Nucleosynthesis
-48 Nuclear physics
- Strontium/Sr-88* - Reactor targets for Sr-89 (used in
bone cancer therapy & labeling of
monoclonal antibodies)
- Thallium/Tl-203* - Targets for Tl-201 production in
accelerators (Tl-201 used in
cardiac imaging)

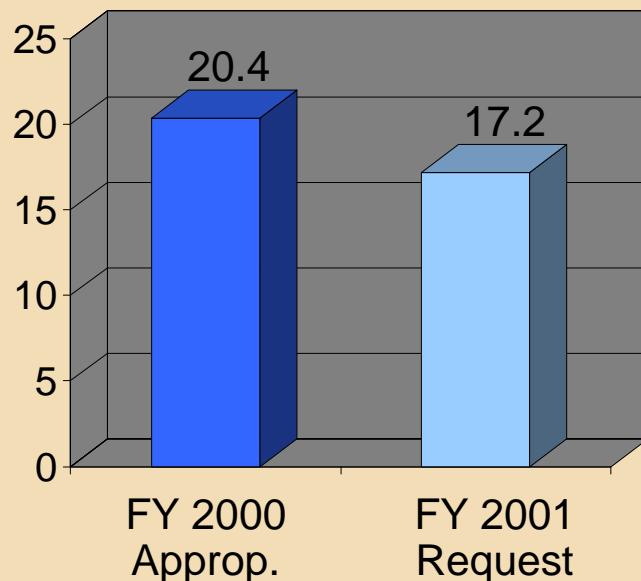
High Flux Isotope Reactor/Inventory:

- Iridium/Ir-192 - Industrial nondestructive examination
- Tin/Sn-117m - Bone pain relief
- Strontium/Sr-89 - Bone pain relief
- Tungsten/W-188 - Cancer therapy
- Actinium/Ac-225 - Cancer therapy

Isotope Support



Funding Profile
(*\$ in Millions*)



FY 2000 Planned Accomplishments

- ◆ Begin the Advanced Nuclear Medicine Initiative by providing isotopes or funding to up to 10 researchers
- ◆ Install equipment at Sandia's Annular Core Research Reactor for production of iodine-125, used for treatment of prostate cancer
- ◆ Invest in two new process development technologies requested by researchers that enhance isotope production and delivery

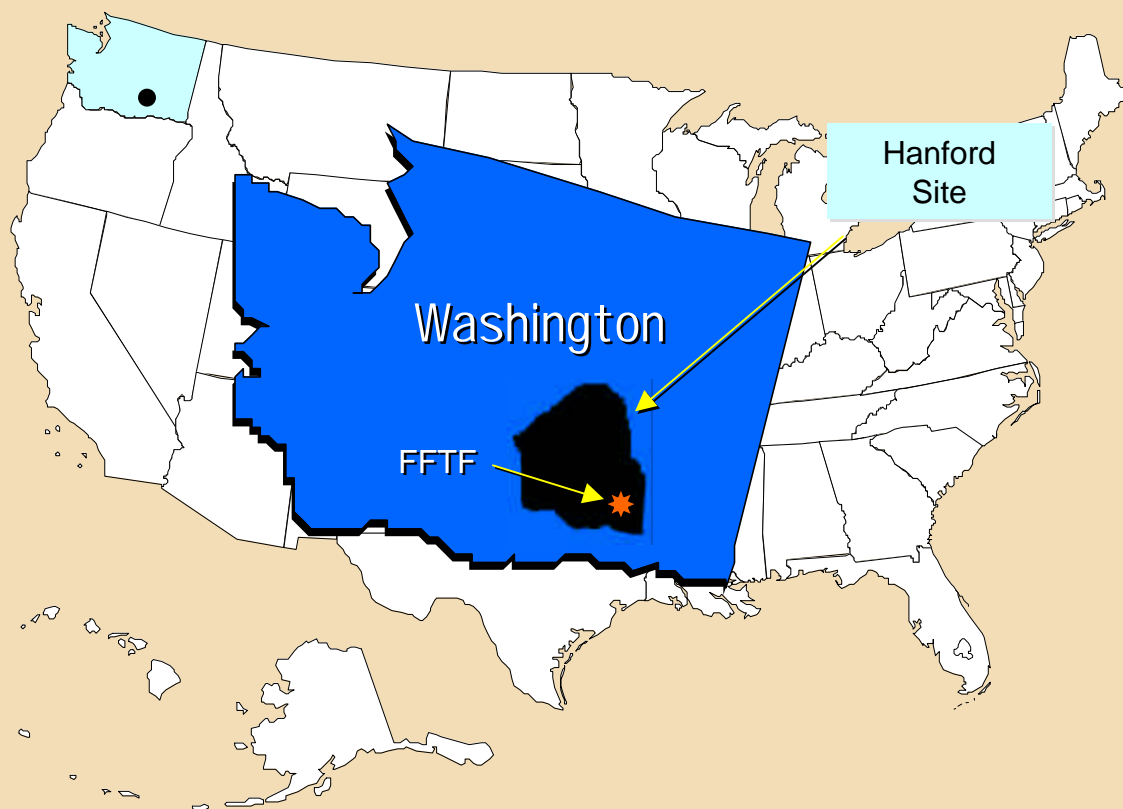
FY 2001 Planned Accomplishments

- ◆ Complete construction of building to house the Los Alamos Isotope Production Facility
- ◆ Design a stable isotope enrichment machine to provide research isotopes at affordable prices and reduced operating costs
- ◆ Supply isotopes to commercial and research customers (over 250 customers and over 1,000 deliveries projected annually)

Fast Flux Test Facility (FFTF)

Mission Statement

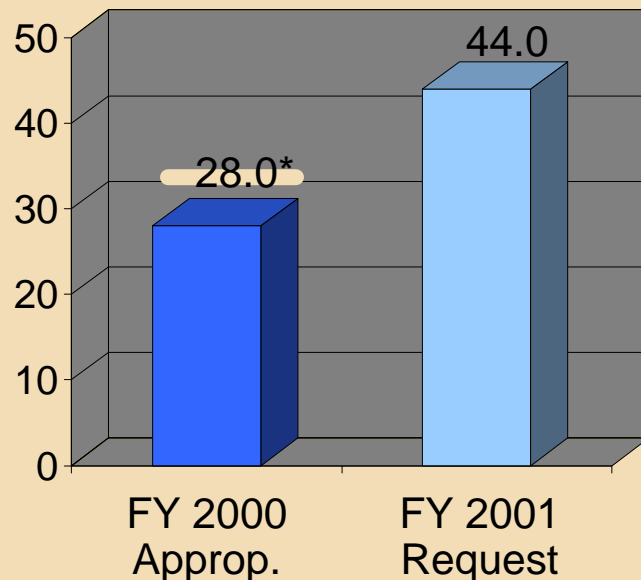
Safely maintain FFTF pending the Secretary of Energy's decision on the future of the facility.



Fast Flux Test Facility (FFTF)



Funding Profile
(\$ in Millions)



*Not including pending reprogramming request

FY 2000 Planned Accomplishments

- ◆ Conduct surveillance and maintenance to ensure no degradation of key plant systems

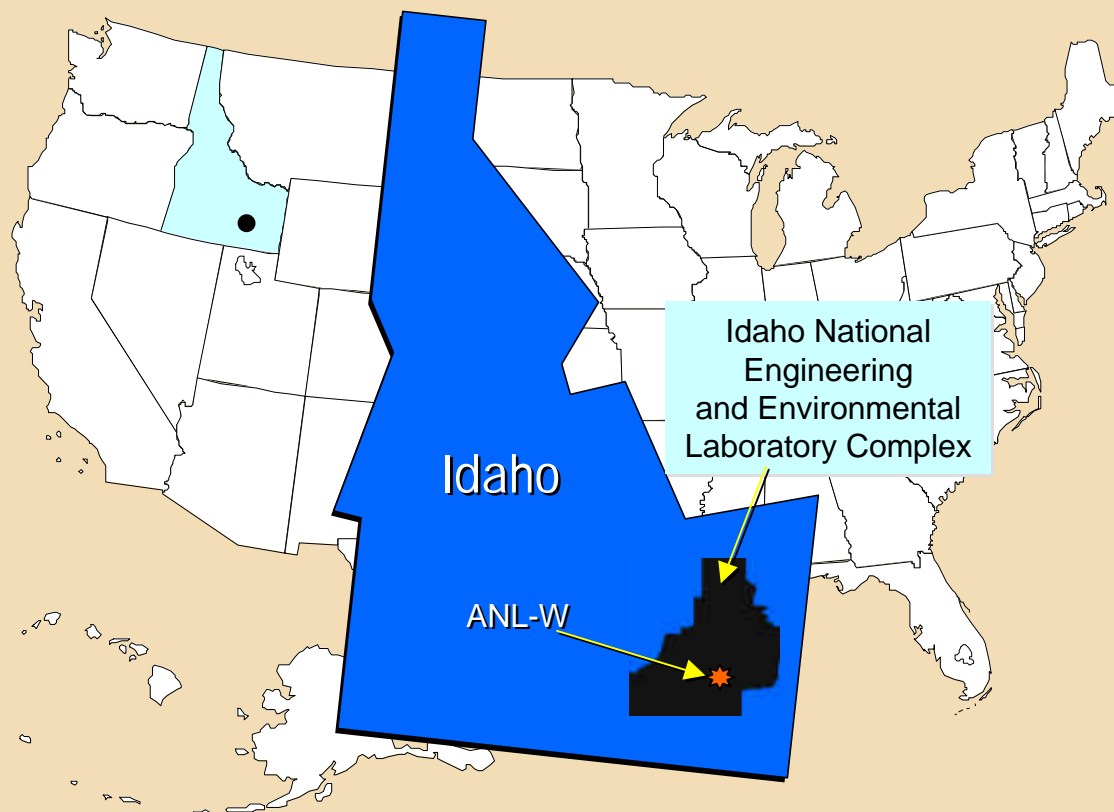
FY 2001 Planned Accomplishments

- ◆ Complete the *Nuclear Infrastructure PEIS* and issue a Record of Decision (ROD)
- ◆ Maintain the facility in hot standby, pending a decision on its future
- ◆ Depending on whether the ROD is for restart or deactivation:
 - Initiate conceptual design activities for system restoration
 - Complete procurement of spent fuel storage casks and drain sodium coolant

Electrometallurgical R&D/Termination Costs Argonne National Laboratory-West (ANL-W)

Mission Statement

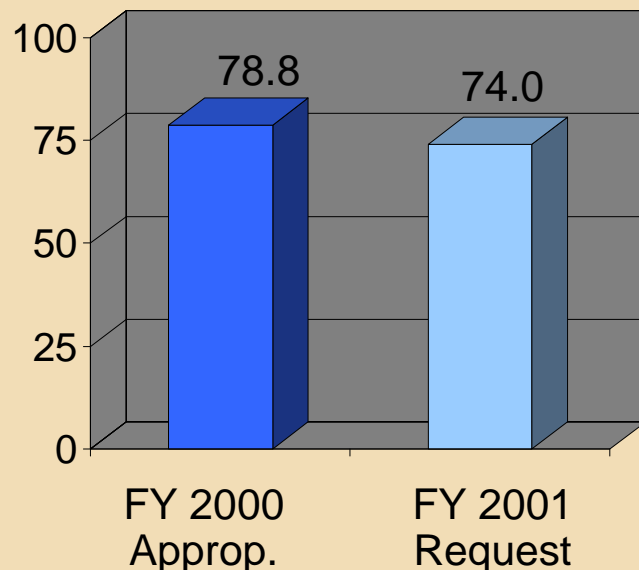
To develop innovative technologies for spent fuel storage and disposal and provide for effective management of active and surplus nuclear research facilities at the Argonne National Laboratory-West.



Electrometallurgical R&D/Termination Costs Argonne National Laboratory-West (ANL-W)



Funding Profile
(\$ in Millions)



FY 2000 Planned Accomplishments

- ◆ Complete EIS and issue a ROD on treatment of sodium bonded fuel
- ◆ Initiate draining and processing of primary system sodium coolant from EBR-II
- ◆ Complete processing of EBR-II secondary system sodium and 40% of stored Fermi reactor coolant

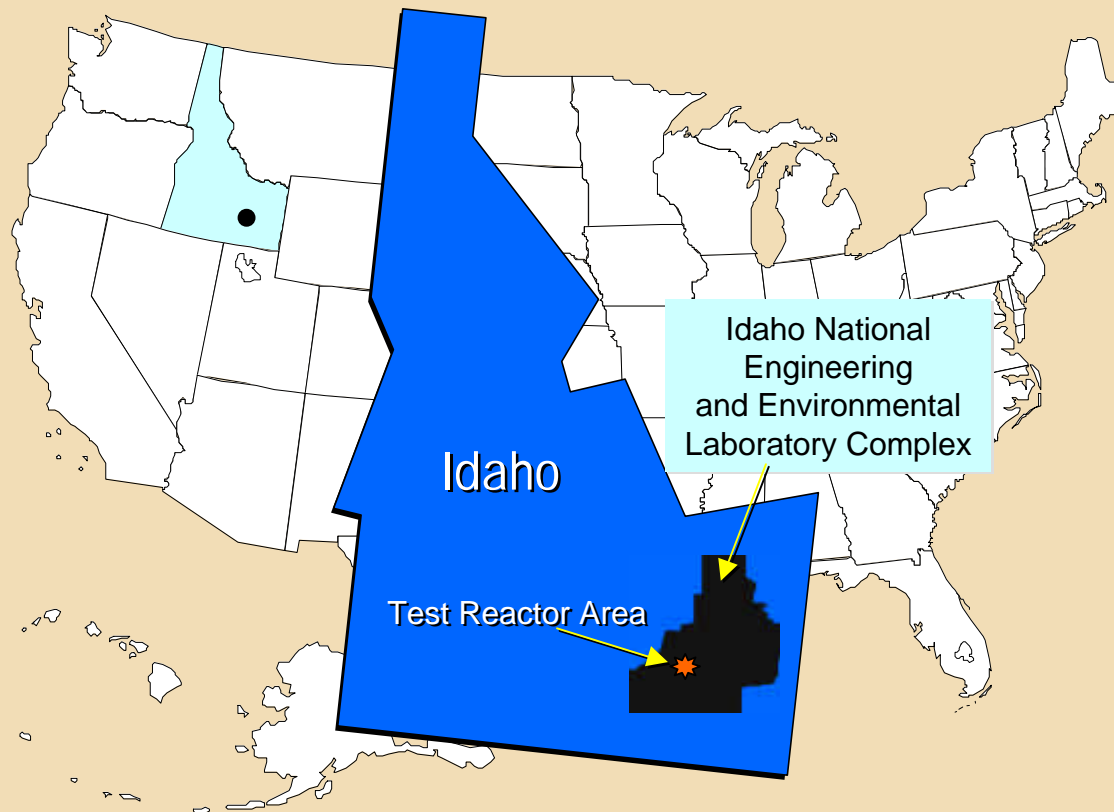
FY 2001 Planned Accomplishments

- ◆ Operate ANL-W facilities in accordance with ROD on management of sodium bonded fuels
- ◆ Complete processing of all sodium and continue deactivation and closure of EBR-II
- ◆ Continue research required to support NRC approval of disposal of metal and ceramic waste forms in a geologic repository

Test Reactor Area (TRA)

Mission Statement

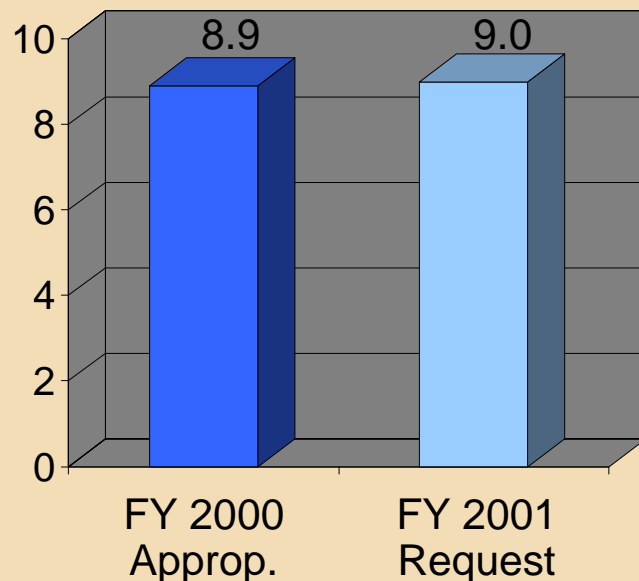
Ensure reliable support for naval reactor fuel and core component testing and production of isotopes for medicine and industry.



Test Reactor Area (TRA)



Funding Profile
(\$ in Millions)



FY 2000 Planned Accomplishments

- ◆ Maintain TRA common facilities and utilities, complying with environment, safety and health requirements
- ◆ Conduct Title II design for the electrical utility upgrade project
- ◆ Continue with major modifications to existing fire suppression systems, facilities, and water supply systems to meet federal and NFPA fire protection standards

FY 2001 Planned Accomplishments

- ◆ Maintain TRA common facilities and area utilities, complying with ESH requirements
- ◆ Complete Title II design and begin construction of electrical utility upgrades
- ◆ Continue design and construction activities associated with upgrading fire protection systems to meet the Life Safety Code and other fire protection requirements